

## Receiver

Spectrum Analyzer	1	HP	8561B	In House
Vector Modulation Analyzer	1	HP	8981B	Rent
BER Test set	1			In House
Noise & Interference	1	HP	3708	Rent

## 5.0 Test Equipment Set Up and Calibration

## 5.1 Equipment Set Up

The 2 Vector HP signal generators used in the tests to simulate the paging transmitters will be allowed to warm-up for a period of 30 minutes before calibration is attempted.

The Spectrum Analyzer will also be allowed a warm up period of 30 minutes.

The BER of the output of the PRBS generators will be checked at the various data rates under test to insure proper operation of the equipment.

## 5.2 Instrument Calibration

All instruments used in the tests will be calibrated to NBS standards.

### 5.3 System Calibration

Before any tests are conducted the test equipment will be allowed to temperature stabilize, before any adjustments are made to frequency or signal level.

### 6. Tests

The radiated output of the vector signal generators must be maintained above the receive threshold of the spectrum analyzer in order to obtain meaningful data. This may require repositioning of the test equipment until these conditions can be met.

Once an adequate signal level is being received by the spectrum analyzer, the output of both vector signal generators will be adjusted to the same level so that the spectrum analyzer is not captured by any one signal generator (This corresponds to the conditions found in an overlap area of a simulcast system).

The baseband signals which will be connected to their respective signal generators.

Once a modulation scheme is under test, measurements will be taken to verify

data rate vs. baud rate

carrier frequency offset

simulation of propagation delays and the ability of the receiver to respond.

### 7. Results

Issues that the test will verify

- \* Are advance modulation techniques capable of increasing data rates in a simulcast environment.
- \* Is the BER of one modulation scheme inherently superior to that of another in a simulcast environment.

- \* How is intersymbol distortion affected by phase delays in advance modulation schemes.
- \* Does frequency offset improve the BER performance of advance modulation schemes in a simulcast environment.

## 7.1 Results Presentation

The tests results will be presented in a series of graphs.

- \* BER of data rate vs. baud rate for each modulation scheme. i.e. 600, 1200, 2400, and 4800 baud.
- \* Comparison of BER versus SNR for each modulation type
- \* BER of signal delays for data rate vs baud rate for each modulation scheme.

## 8. TimeLine

### Key Milestones

April 24	- Formulate Test Plan	Test Document
May 1	- Approved Test Plan	
May 29	- Order Test Equipment	
June 12	- Receive Test Equipment	
June 15	- Start Tests	
June 26	- Complete Tests	
June 29	- Begin Results Analysis	
July 03	- Finish Results Analysis	
July 17	- Complete Documentation of Results	

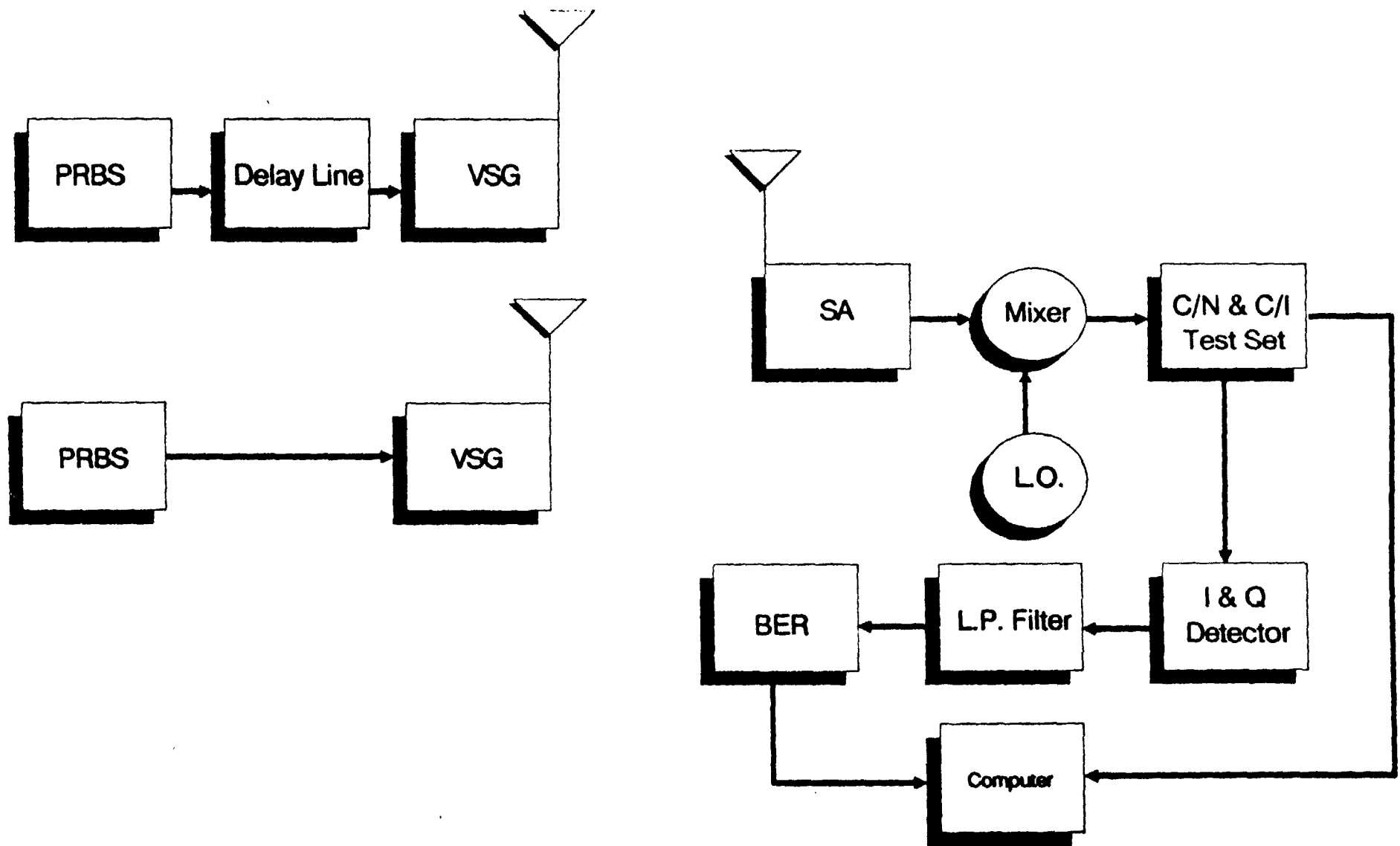


Figure 1 System Block Diagram

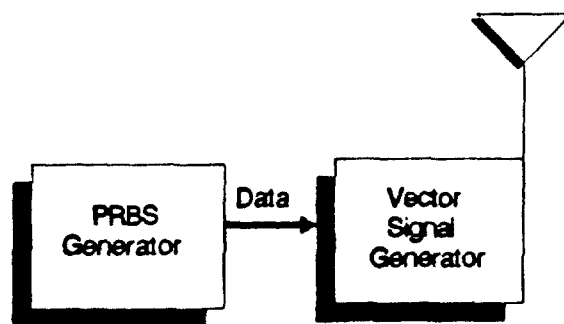


Figure 2 Transmitter Block Diagram

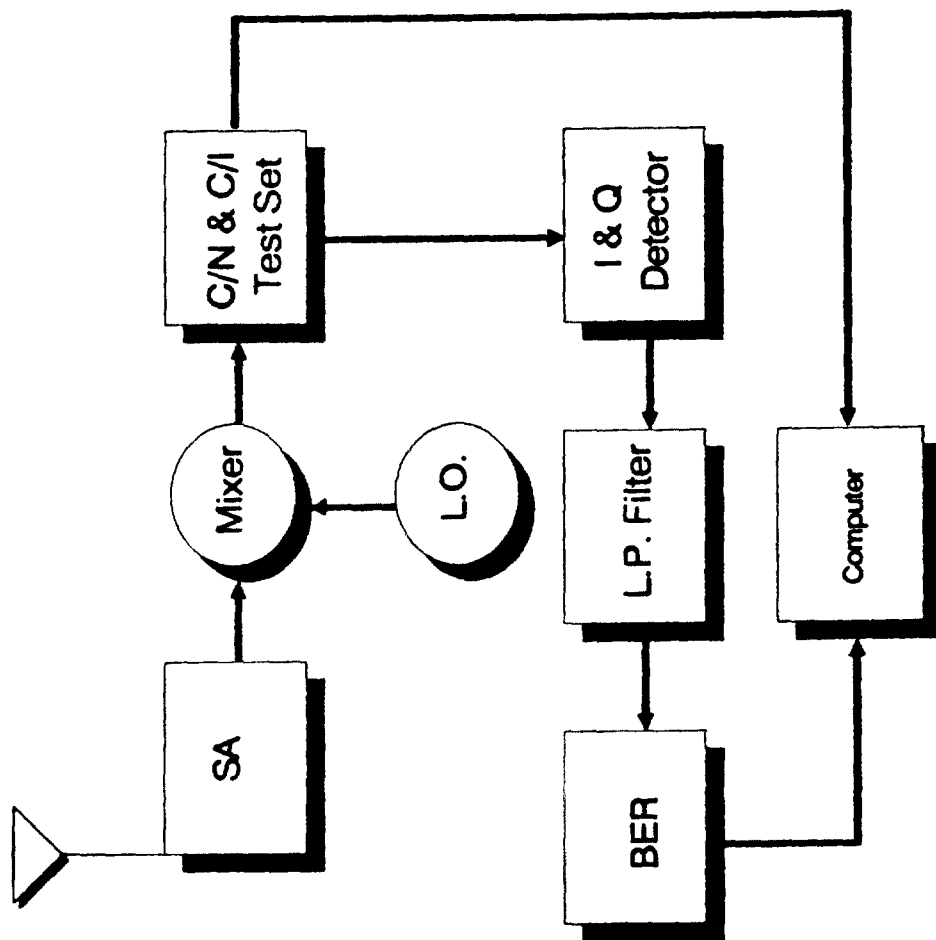


Figure 3 Receiver Block Diagram

## **ATTACHMENT 6**

MEETING WITH OFFICE OF ENGINEERING AND  
TECHNOLOGY  
SECOND REPORT

AUGUST 21, 1992

PACTEL PAGING  
Three Forest Plaza, SUITE 800  
Dallas, Texas 75251



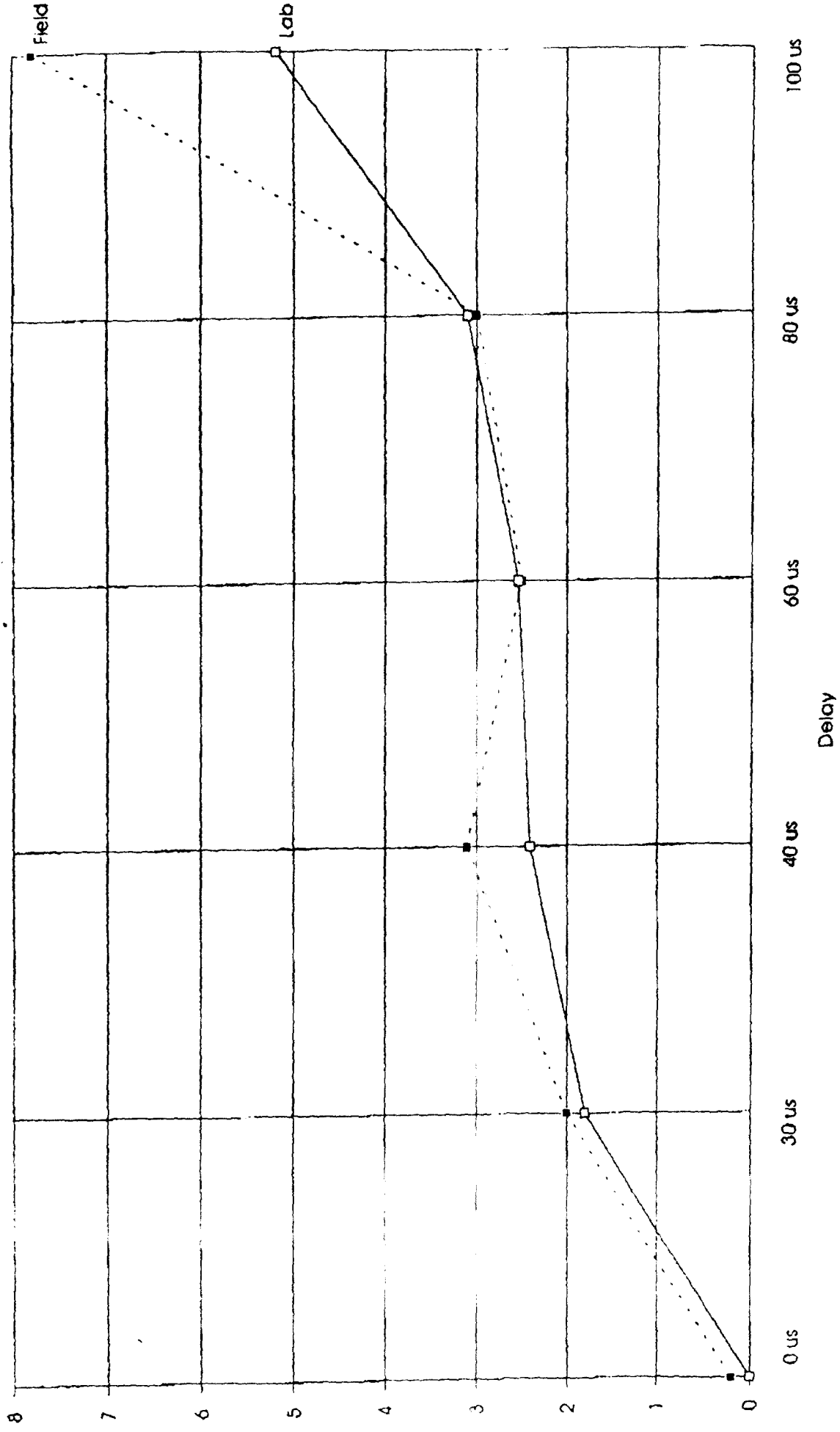
# **FRAMEWORK**

- **PACTEL EXPERIMENTATION IS BASIC RESEARCH ON THE SIMULCAST BARRIER**
  - **THIS EXPERIMENTATION IS APPLICABLE IRRESPECTIVE OF MODE, CODING SCHEME, OR FORMAT**
- **PACTEL'S NEXT EXPERIMENTAL PHASE IS TO BEGIN DEVELOPING A SYSTEM WHICH INCORPORATES THE BASIC RESEARCH IT HAS DEVELOPED**
  - **THIS SYSTEM MUST ALLOW FOR GRACEFUL INCREASES IN SPEED AND CAPACITY**
  - **THIS SYSTEM MUST BE ECONOMICAL AND EFFICIENT**
  - **PACTEL WILL BUILD THIS SYSTEM USING ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM) ON A 25 KHZ CHANNEL(S)**
    - **THE BASIC RESEARCH WILL BE INCORPORATED INTO HOW FAST THE INFORMATION IN EACH SUBBAND CAN BE SENT**

# 4800 Baud Test Results

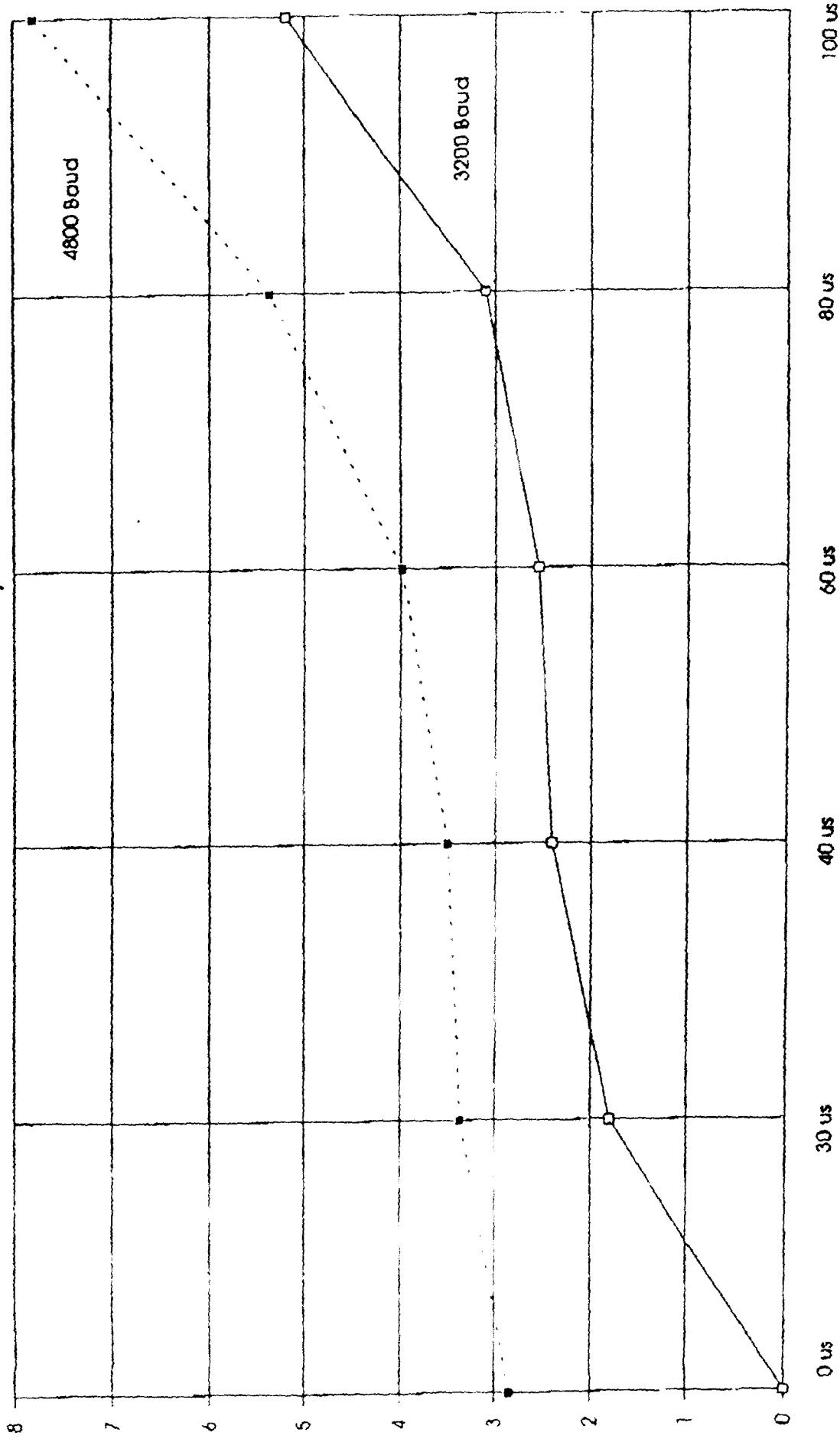
- Investigate the performance of 4800 Baud in a Simulcast environment.
  - Conclusion:  
4800 baud can be used in a Simulcast environment but system delay must be kept under 50 us.
-

BER 10E-3



### 3200 Baud Test Results

PER 10E-3

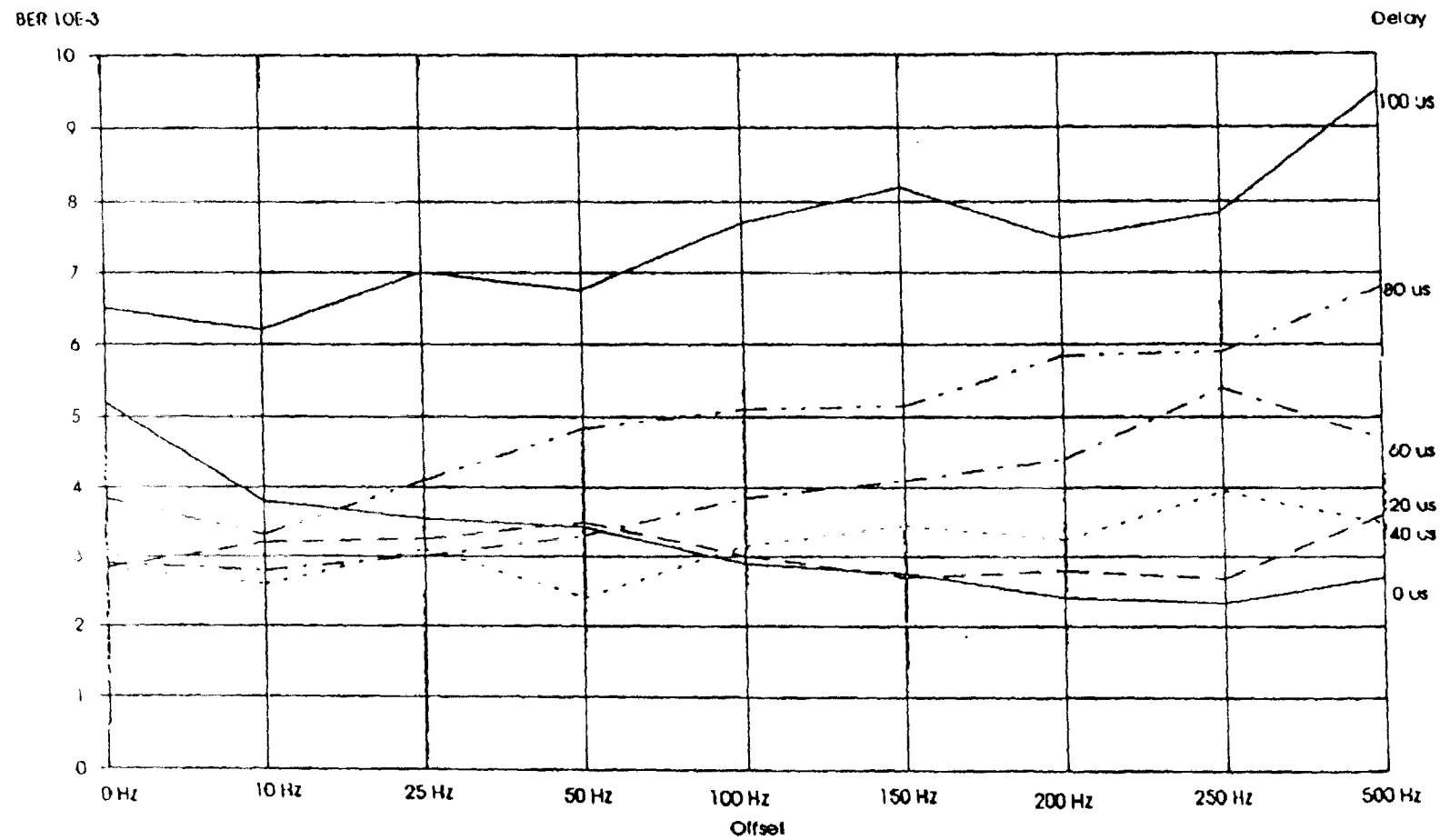


### 4800 Baud Test Results

# **Delay Versus Frequency Offset**

- Analyze the effect of delay between transmitters and their Bit Error Rate performance.
- Analyze the effect of Frequency Offset between transmitters and their Bit Error Rate performance.





Frequency Offset vs. Delay

# Advanced Modulation Schemes (Cont.)

- Digital Modulation Tests Underway.  
Modulations Schemes being investigated.  
QPSK    8PSK    16 QAM    64 QAM

## *Preliminary Results:*

Intersymbol interference at 0 frequency offset and 0 us delay too great to cause signal capture.

PRBS generator being modified to provide 9.6 and 19.2 kBaud and ability to provide delay between the two transmit data sources.

---

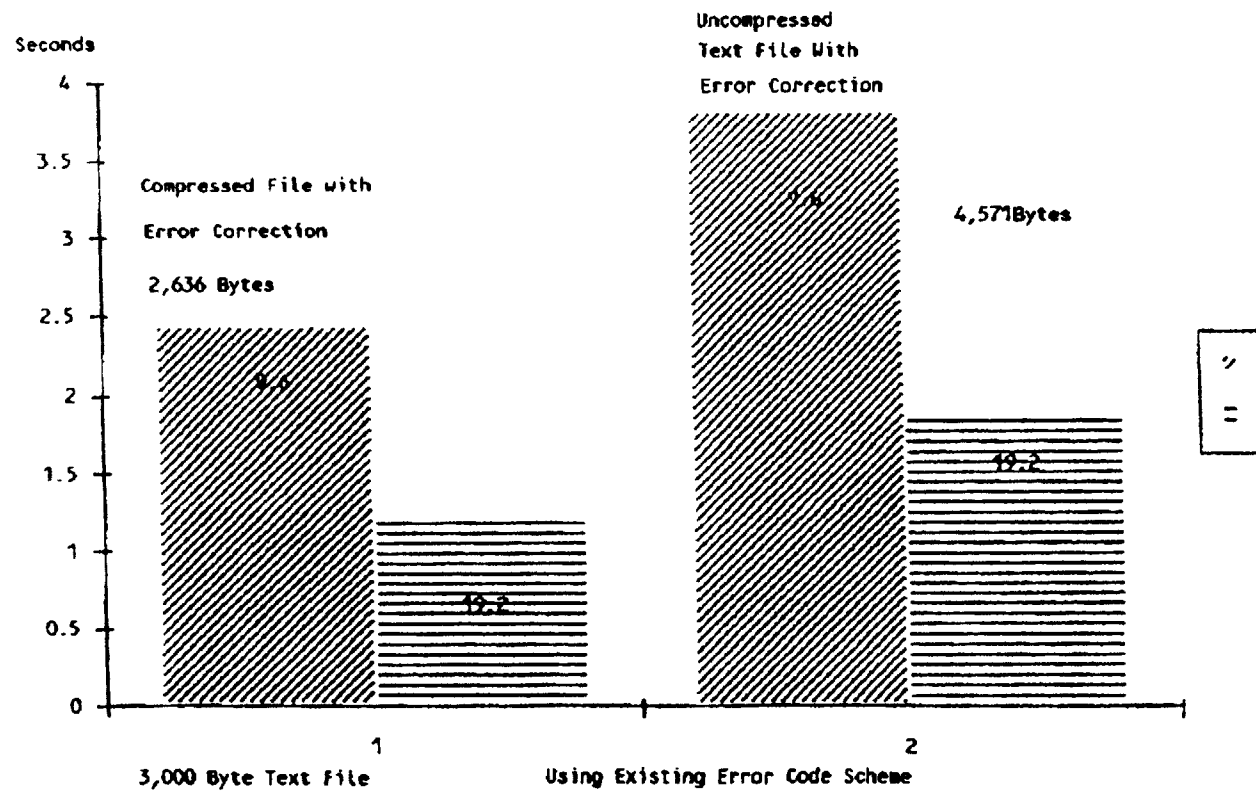
- Data Compression

Current paging transmits data uncompressed  
Does not impact existing technology.

Advanced Paging Systems sending large data files such as facsimile, E-mail or graphics, requires data compression in order to maintain high level of system throughout.

---





# CONCLUSIONS AND NEXT STEPS

- **THE MAXIMUM SIMULCAST SPEED IS 4800 BAUD, NOT 3200 BAUD AS PREVIOUSLY THOUGHT**
  - **THIS ALLOWS FOR AN INCREASE IN CAPACITY OF 33% OVER SYSTEMS USING 3200 BAUD SIMULCAST SPEEDS**
- **USING THIS BASIC RESEARCH, PACTEL HAS DEVELOPED A SYSTEM ARCHITECTURE, ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM), WHICH WILL ALLOW FOR EFFECTIVE CAPACITY OF 19.2K-26K BITS PER 25 KHZ**
  - **FOR COMPARISON, IF THE CHANNEL SPACING WAS 50 KHZ, PACTEL'S SYSTEM COULD PROVIDE EFFECTIVE RATES OF 38.4-52K BITS PER SECOND PER CHANNEL**
  - **THIS SYSTEM WOULD SUPPORT 60,000 TO 80,000 NATIONWIDE SUBSCRIBERS PER CHANNEL WITH AN AVERAGE MESSAGE LENGTH OF 5,000 BITS (A SMALL DOS FILE) OR 180,000 TO 240,000 SUBSCRIBERS EACH RECEIVING ONLY REGION SERVICE**

## **NEXT STEPS (CONT'D)**

- **THIS COULD BE EXPANDED EVEN FURTHER WITH THE USE OF AN ACKNOWLEDGEMENT/SETUP CHANNEL WHICH WOULD ALLOW THE MESSAGE TO BE TRANSMITTED ONLY IN THE METROPOLITAN AREA WHERE THE SUBSCRIBER IS LOCATED**
  - **ASSUMING ACKNOWLEDGEMENT/SETUP CHANNELS USED IN TOP 30 MARKETS, THEN CAPACITY OF SINGLE SYSTEM COULD BE INCREASED TO 5.4-7.2 MILLION SUBSCRIBERS PER CHANNEL**
- **THIS IS COMPARED TO CURRENT TODAY'S SYSTEMS WHICH COULD SUPPORT LESS THAN 2,000 SUCH SUBSCRIBERS IN THE SAME BANDWIDTH -  
- A POTENTIAL 6,000% INCREASE IN CAPACITY**
- **PACTEL HAS BEGUN BUILDING THE NECESSARY EQUIPMENT TO EXPERIMENT WITH SUCH SYSTEMS IN THE FIELD AND IT EXPECTS TO HAVE RESULTS TO REPORT TO THE COMMISSION WITHIN THE NEXT SEVERAL MONTHS**
- **ONCE THE NECESSARY EQUIPMENT IS BUILT, PACTEL WILL CONDUCT SYSTEM TESTS UNDER ITS PARENT'S EXPERIMENTAL LICENSE**
- **PACTEL WILL AT THE SAME TIME CONTINUE WORKING WITH MANUFACTURERS AND INDUSTRY COMMITTEES TO DEVELOP THE NECESSARY CODING SCHEMES AND INFRASTRUCTURE TO OFFER THE SERVICE**

**CERTIFICATE OF SERVICE**

I, Tana Christine Maples, a secretary in the law firm of Bryan Cave, do hereby certify that on this 14th day of September, 1992 copies of the foregoing **Petition for Reconsideration of Tentative Decision Denying Preference Request** were hand delivered, courier charges prepaid or mailed via first class U.S. mail, postage prepaid to the following:

Honorable Alfred C. Sikes\*  
Chairman  
Federal Communications Commission  
1919 M Street, N.W., Room 814  
Washington, D.C. 20554

Honorable James H. Quello\*  
Commissioner  
Federal Communications Commission  
1919 M Street, N.W., Room 802  
Washington, D.C. 20554

Honorable Sherrie P. Marshall\*  
Commissioner  
Federal Communications Commission  
1919 M Street, N.W. Room 826  
Washington, D.C. 20554

Honorable Andrew C. Barrett\*  
Commissioner  
Federal Communications Commission  
1919 M Street, N.W., Room 844  
Washington, D.C. 20554

Honorable Ervin S. Duggan\*  
Commissioner  
Federal Communications Commission  
1919 M Street, N.W., Room 832  
Washington, D.C. 20554

Cheryl Tritt, Chief\*  
Common Carrier Bureau  
Federal Communications Commission  
1919 M Street, N.W., Room 500  
Washington, D.C. 20554

Thomas P. Stanley\*  
Chief Engineer  
Federal Communications Commission  
2025 M Street, N.W., Room 7002  
Washington, D.C. 20554

David R. Siddall\*  
Office of Engineering & Technology  
2025 M Street, N.W., Room 7102-A  
Washington, D.C. 20554

Carl Huie\*  
Office of Engineering & Technology  
2025 M Street, N.W., Room 7102-B  
Washington, D.C. 20554

Rodney Small\*  
Office of Engineering & Technology  
2025 M Street, N.W., Room 7332  
Washington, D.C. 20554

Lawrence M. Miller  
Schwartz, Woods & Miller  
Suite 300  
The Dupont Circle Building  
1350 Connecticut Avenue, N.W.  
Washington, D.C. 20036  
**Counsel for Global Enhanced Messaging Venture**

Gerald S. McGowan  
Marjorie Giller Spivak, Esquire  
Lukas, McGowan, Nace & Gutierrez, Chartered  
1819 H Street, N.W., Seventh Floor  
Washington, D.C. 20006  
**Counsel for Dial Page, L.P.**

Judith St. Ledger-Roty  
Reed, Smith, Shaw & McClay  
1200 18th Street, N.W.  
Washington, D.C. 20036  
**Counsel for Paging Network, Inc.**

Jeffrey Blumenfeld  
Blumenfeld & Cohen  
1615 M Street, N.W.  
Suite 700  
Washington, D.C. 20036  
**Counsel for PageMart, Inc.**

Steve Stutman  
Metriplex  
25 First Street  
Cambridge, MA 02141

Matt Edwards  
President  
SKYCELL CORPORATION  
116 Gray Street, Clemens Center  
Elmira, New York 19402

L. Andrew Tollin  
Michael Deuel Sullivan  
Wilkinson, Barker, Knauer & Quinn  
1735 New York Avenue, N.W.  
Washington, D.C. 20006  
**Counsel for Mobile Communications  
Corporation of America**

Richard E. Wiley  
R. Michael Senkowski  
David E. Hilliard  
Eric W. DeSilva  
Wiley, Rein & Fielding  
1776 K Street, N.W.  
Washington, D.C. 20006  
**Counsel for Mobile Telecommunications  
Technologies, Inc.**

Thomas J. Casey  
Jay L. Birnbaum  
Simone Wu  
Skadden, Arps, Slate, Meagher & Flom  
1440 New York Avenue, N.W.  
Washington, D.C. 20005  
**Counsel to Echo Group, L.P.**

Lawrence J. Movshin  
Robert L. Hoggart  
Thelen, Marrin, Johnson & Bridges  
805 15th Street, N.W., Suite 900  
Washington, D.C. 20005-2207  
**Counsel for Metriplex, Inc.**

Fred McCallum, Jr.  
Vice President-General Counsel  
MobileComm  
1800 E. County Line Road  
Suite 300  
Ridgeland, MS 39157

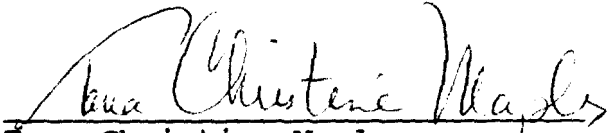
Matt Edwards  
President  
MONTAUK TELECOMMUNICATIONS  
CORPORATION  
Post Office Box 2576  
Montauk, New York 11954

Robert M. Jackson  
John A. Prendergast  
Blooston, Mordkofsky, Jackson  
& Dickens  
2120 L Street, N.W.  
Washington, D.C. 20037  
**Counsel for Freeman  
Engineering Associates**

Frederick M. Joyce  
Joyce & Jacobs  
2300 M Street, N.W.  
Eighth Floor  
Washington, D.C. 20037  
Counsel for CelPage, Inc.

Martin A. Schwartz  
President  
Richard J. Helferich  
Vice President  
Minilec Service, Inc.  
9321 Eton Avenue  
Chatsworth, CA 91311

Kenneth E. Hardman, P.C.  
1255 23rd Street, N.W.  
Suite 800  
Washington, D.C. 20037  
Counsel for Minilec Service, Inc.

  
Tana Christine Maples

\* denotes hand delivery